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CONCEPTUAL DESIGN AND DRAFT EIS/EIR

CalTrain Terminal Track and Platform Analysis Report

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TABLE OF CONTENTS

Page

1. INTRODUCTION 1

2. CURRENT CALTRAIN SERVICE 1

2.1 Operations 1
2.2 Existing Terminal Station at Fourth and Townsend 2

3. OPTIONS FOR A NEW TERMINAL STATION 2

3.1 Market/Beale 2
3.2 Transbay Terminal Site 5

4. TERMINAL TRACK NEEDS AND CAPACITY 5

4.1 New Train Service Assumptions 5
4.2 Operating Capacity Analysis Methodology 6
4.3 Model Results and Conclusions 7
4.4 Physical Site Constraints 8

4.4.1 Market/Beale Street Terminal 8
4.4.2 Transbay Terminal 10

5. EFFECTS OF THE NUMBER OF TRACKS ON CALTRAIN OPERATIONS 10

5.1 Train Storage 10
5.2 Changes to Train Sizes 13

6. TERMINAL STATION PLATFORM CONFIGURATION OPTIONS 14

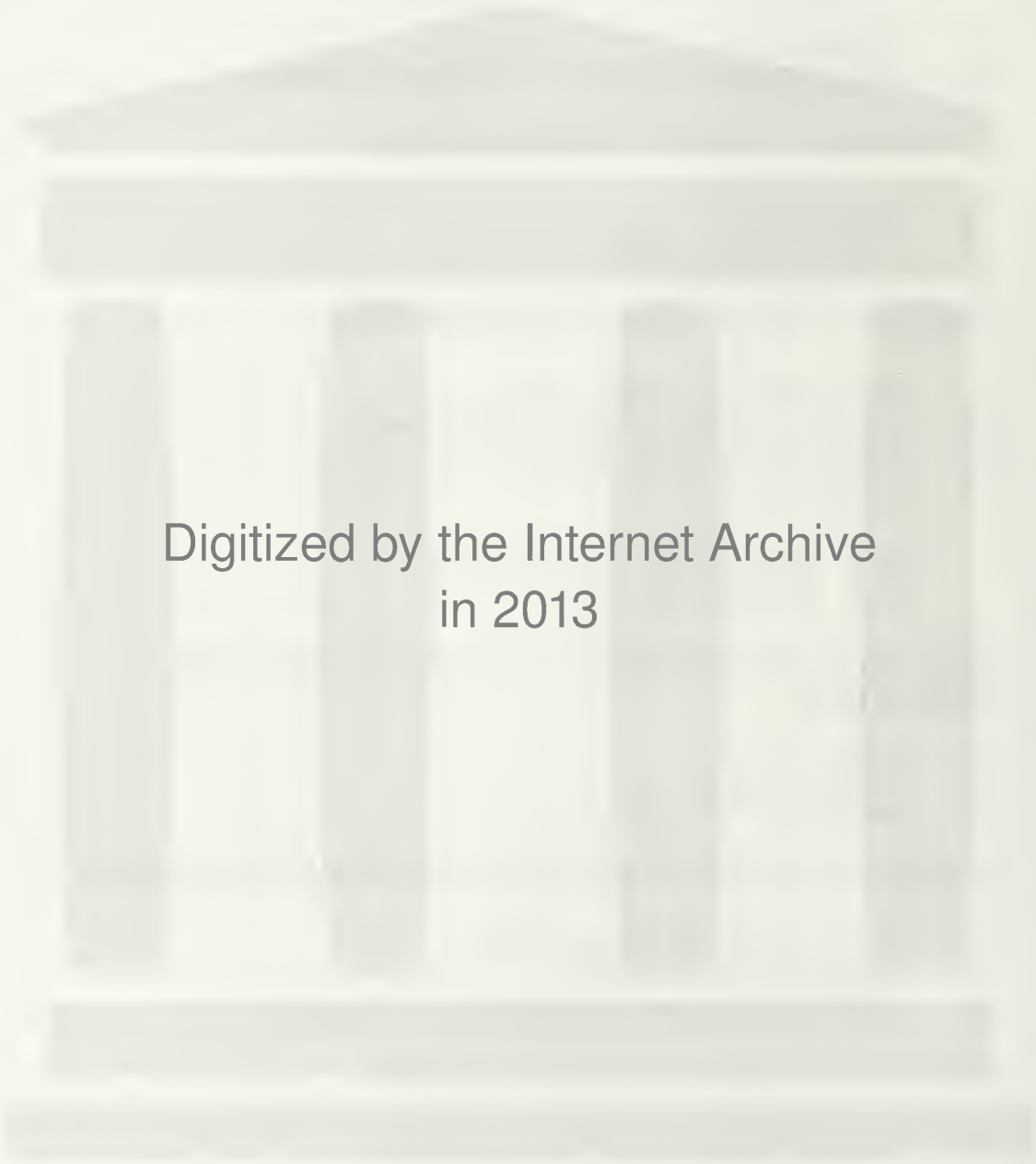
6.1 Types of Platform Configurations 14
6.2 Passenger Flow Controls 15
6.3 ADA Requirements and Emergency Evacuation 16

7. INTER-CITY PASSENGER TRAIN SERVICE 16

7.1 Possible Intercity Train Track Locations 17
7.2 Intercity Train Platforms 17

8. FUTURE MISSION BAY STATION 18

Appendix A: Train Schedule and Track Occupancy Calculations 19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1. INTRODUCTION

The purpose of this report is to evaluate and offer recommendations regarding the number, length, and configuration of train tracks and to review passenger platform options for a new Peninsula Commute Service (CalTrain) commuter rail terminal station in downtown San Francisco. This evaluation is part of an overall review of environmental impacts, costs, and benefits associated with alternatives for extending CalTrain from its present northern terminus station at Fourth and Townsend Streets to a new location about 1.5 miles closer to downtown San Francisco.

Requirements for new terminal station tracks are related to CalTrain's anticipated future train operations and passenger demands. Determination of physical track needs involves analysis of peak demand for track usage; train sizes; and the periods of time that each train would occupy segments of the track and would be at the platform to discharge and load passengers. Physical constraints for track and platform facilities relate to the available space, particularly in the highly urbanized downtown San Francisco area, and associated cost and construction considerations. Platform options include center and side platform configurations. An additional consideration is the ability to control passenger access to platforms during off-peak hours.

2. CURRENT CALTRAIN SERVICE

2.1 Operations

CalTrain service currently consists of 60 trains per day -- thirty in each direction. Trains are typically four or five cars long, powered by a single locomotive. All trains currently enter and depart the station with the same number of cars; there is no change in train length at the terminal. During special events, which occur a few times each year, trains may be up to ten cars long. Existing gallery cars have a seating capacity of 145 people, while cab cars have 140 seats.

Weekday train service is focused in the peak periods and in the peak direction - i.e., a majority of morning trains head north to San Francisco in the peak period and a majority of afternoon trains head south to the Peninsula in the peak period. During the morning peak hour from 7 to 8 am, seven trains arrive at and four depart from the current San Francisco terminal. In the evening peak hour from 4:50 to 5:50 pm, six trains leave and three arrive in San Francisco. Hourly service is operated during off-peak hours, with trains departing San Francisco on the hour and arriving from San Jose at approximately the half-hour.

Trains operate in a push-pull mode, with the locomotive always located at the south end of the train pushing toward San Francisco. A cab cars is located at the north end of the train. This configuration minimizes the walk distances from the passenger cars to the platform gates at the San Francisco terminal.

2.2 Existing Terminal Station at Fourth and Townsend

The existing CalTrain terminal station, located at Fourth and Townsend Streets in the City of San Francisco, occupies the entire block between Townsend Street on the north and King Street on the south. The station area includes twelve tracks and six center platforms at ground level. Platforms are 18 feet wide and vary in length from 650 to 840 feet. Each platform has a single point of access controlled by a manually operated gate at the stub end of the tracks. Passengers waiting to board a departing train are kept behind the gate until shortly before train departure time. Tracks between the platforms are spaced at 13 feet, which is less than the 14-foot minimum now allowed under California Public Utilities Commission General Order 26D.

Seven tracks are used for revenue service during the morning and afternoon peak hours. Fewer tracks are used for revenue service during off-peak hours; although, over the course of a day, all 12 tracks are used for revenue service or for train storage and switching. The terminal area also has storage and service tracks, where various activities such as fueling, cleaning, and light maintenance are performed during the mid-day.

3. OPTIONS FOR A NEW TERMINAL STATION

Two terminal locations are under study for the CalTrain extension to downtown San Francisco: (1) Beale Street at Market Street, and (2) the Transbay Terminal site. Three terminal station design configurations are under consideration at the Market/Beale location. Two design configurations are being reviewed for the Transbay Terminal site. Each new terminal would be stub-ended and would be 1,000 feet long to allow for eventual ten-car trains. Alternative terminal locations and routes are shown in Figure 1.

3.1 Market/Beale

Design options for the Market/Beale site include:

- a three-level station abutting Market Street with a mezzanine below street level and two levels of track below the mezzanine;

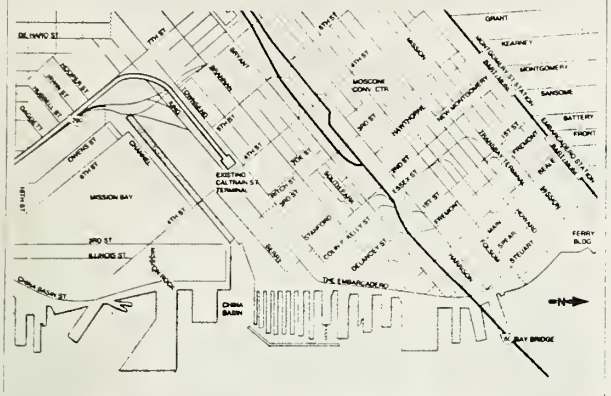
  a "staggered" two-level station with a mezzanine and two tracks under Beale Street abutting Market Street and a mezzanine and two tracks adjoining Beale Street on the east with a northern terminus near Mission Street; and

- a two-level station with a mezzanine and four tracks, with two tracks under Beale Street and two tracks east of Beale Street with a northern terminus for all tracks at Mission Street and an underground concourse with moving sidewalks connecting the mezzanine with the Embarcadero Muni/BART Station.

All three Market/Beale station design options would allow for convenient underground access to the Muni/BART Embarcadero Station.

FIGURE 1

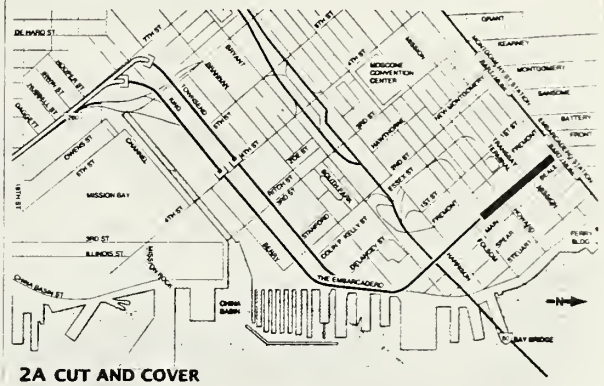
Alternative 1: "NO BUILD"



ALTERNATIVE 1
"NO BUILD"

In Alternative 1, the CalTrain terminal would remain at its current location at Fourth and Townsend streets. Muni Metro light-rail service between the terminal and the downtown area would assist CalTrain riders in reaching their destinations quickly and easily.

Alternative 2: MARKET & BEALE STREETS



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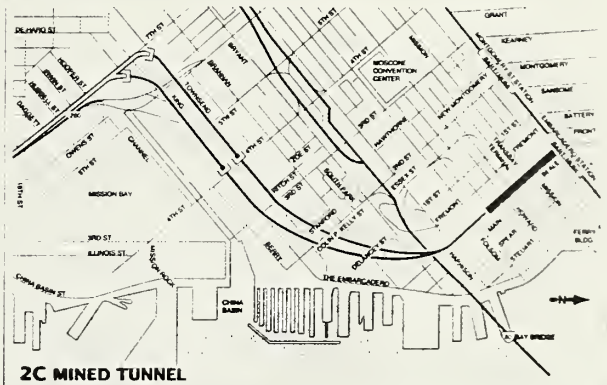


2C MINED TUNNEL

ALTERNATIVE 2
MARKET & BEALE STREETS
Maps 2A and 2C

In Alternative 2, CalTrain would be extended to an underground station at Market and Beale streets. A direct underground connection would be provided to BART and Muni Metro service at the Embarcadero Station.

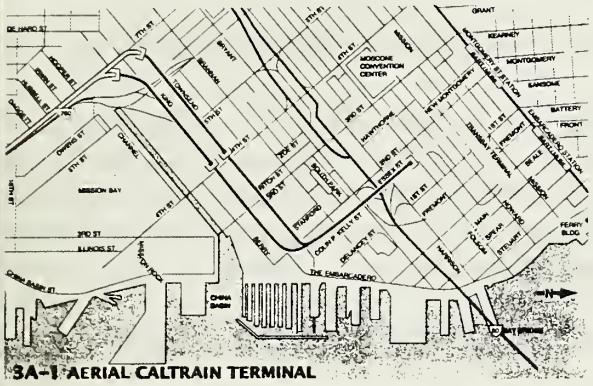
CalTrain would be routed either below or along the surface of Townsend Street to Fourth Street. Should Townsend Street prove infeasible, King Street would be considered. From Fourth Street, Caltrain would travel along one of the two following alignments:

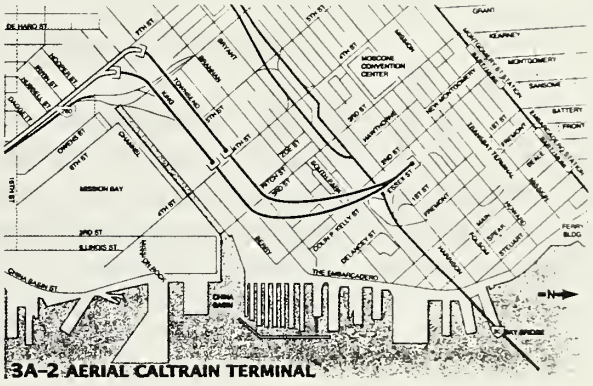
Option 2A CalTrain would operate underground directly below Townsend, Embarcadero, and Beale streets to the Market and Beale station. This alignment would be constructed using the cut-and-cover technique.

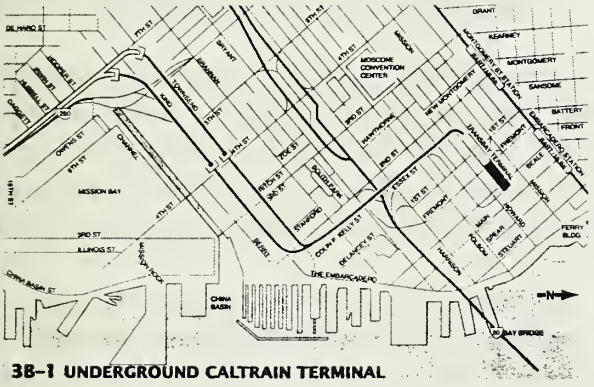
Option 2C CalTrain would travel through a mined tunnel from Third and Townsend streets to Harrison and Beale streets, passing deep underneath a number of private properties in the South Beach/Rincon Hill area. From there, CalTrain would continue underground to Market and Beale streets, using the cut-and-cover construction technique

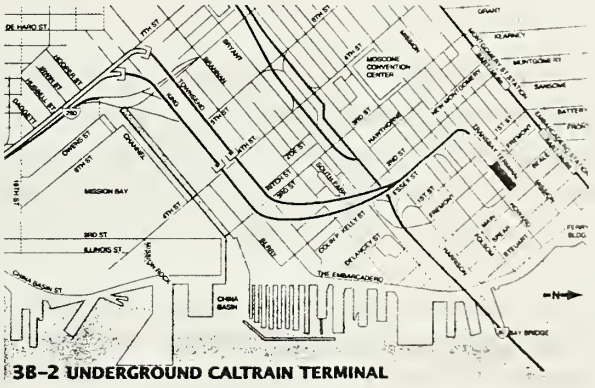
FIGURE 1 (Continued)

Alternative 3: NEW TRANSBAY TERMINAL, EXISTING SITE









ALTERNATIVE 3
NEW TRANSBAY TERMINAL, EXISTING SITE
Maps 3A-1, 3A-2, 3B-1 and 3B-2

In Alternative 3, the existing Transbay Terminal would be demolished and a new building would be constructed on the same site. The new structure would incorporate a CalTrain station either on the second level (Option 3A) or below the surface (Option 3B).

CalTrain would be routed either below or along the surface of Townsend Street to Fourth Street. Should Townsend Street prove infeasible, King Street would be considered. From Fourth Street, Caltrain would travel along one of the two following alignments:

Options 3A-1, 3B-1 CalTrain would operate underground directly below Townsend and Colin P. Kelly/Essex streets to Folsom Street. From there, CalTrain would either begin ascending to the second-level station (3A-1) or continue traveling underground to the subsurface station (3B-1). This alignment would be constructed using the cut-and-cover and tunneling techniques.

Options 3A-2, 3B-2 CalTrain would travel through a mined tunnel from Third and Townsend streets to Folsom and Essex streets, passing deep underneath a number of private properties. From there, CalTrain would either begin ascending to the second-level station (3A-2) or continue traveling underground to the subsurface station (3B-2), using the cut-and-cover construction technique.

Surface Underground Portal Options Aerial New Bus Terminal–Above Ground

3.2 Transbay Terminal Site

Design configurations for the Transbay Terminal site include:

- ☐ a new **underground** CalTrain station on the Transbay Terminal site; and
- ☐ a new **aerial** CalTrain station on the Transbay Terminal site.

Due to seismic, cost, urban design, and other considerations , the City of San Francisco Mayor, the Citizens Advisory Committee for the San Francisco Transbay Area Plan Study, the City planning staff and the Peninsula Commute Service Joint Powers Board (JPB) have decided to not evaluate further the renovation of the existing Transbay Terminal for use as a new CalTrain terminal station (See "Transbay Terminal Renovation Analysis" Report).

4. TERMINAL TRACK NEEDS AND CAPACITY

4.1 New Train Service Assumptions

Number of trains: Service level increases under consideration by the JPB include the addition of trains, mainly during non-peak hours. Current service levels include 60 trains per day. Increased levels of 66, 72, 86 and 114 daily trains have been proposed in the past, with most trains added during the mid-day and evening off-peak hours. Under these proposals, peak hour train service would be only slightly increased over the current schedule.

To analyze train track needs and constraints, increased CalTrain morning peak hour service is assumed to consist of nine trains arriving in San Francisco and four trains departing. In relation to the current morning peak hour operations, this assumption represents an increase of two arriving trains, with no increase in the number of outbound trains.

Train consist and capacity: For the future service assumption, each arriving train would consist of up to ten cars powered by two locomotives. Current trains are typically four or five cars long with one locomotive. Existing CalTrain gallery cars have 145 seats, while the new California commuter cars now on order will have 127 to 132 seats. For this analysis, each car is assumed to have a maximum of 160 passengers, yielding a total passenger load of 1,600 for a ten-car train.

Train turnaround: Based on observations of alighting at the existing terminal, it is estimated that all passengers can exit a fully loaded commuter rail car in under two minutes. Less accurate estimates are available for boarding, given that current boarding takes place during the interval of time between the gates opening and the train doors closing. This interval may be 5 to 15 minutes. It appears reasonable to assume that passengers waiting to board an incoming train could all board within three minutes. Thus a total minimum train turnaround time of five minutes was selected, based on passenger alighting and boarding. This interval does not include any extraordinary delays for disabled passengers. (ADA facilities are discussed in Section 6.3.)

In terms of train operations, a minimum of five minutes is needed to turn a commuter train around, using a second crew either waiting on the platform or already on the tail end of the train. This operation consists of the conductor and train crew disembarking inbound passengers, walking through the train to ensure that everyone is off, and making a quick check for lost articles. At the same time, the engineer secures the operating cab. The engineer and conductor of the departing train then make the required brake test and board the outbound passengers. Additional operations, such as uncoupling to change train length (see Section 5.2), would extend the minimum turnaround time.

For ADA compliance, the solution applied for CalTrain rolling stock since July 1995 involves the use of a hand-operated lift (similar to that currently used by Amtrak), with a modified longer ramp into the car and some stanchions removed from the steps. New California commuter cars will have on-board, mechanically-operated ramps. In either case, it is assumed that not more than five minutes will be required to deboard and board mobility impaired passengers requiring the use of a wheelchair lifting device.

The Platform length needed for the ten-car train and two locomotives is approximately 1,000 feet.

Track geometry currently is being developed for each CalTrain alignment option. For this analysis, a composite "worst-case" track layout, which includes the most difficult and time-consuming track geometry components from all of the alignment and terminal station design options, was used as the basis for calculating travel times and train movements in and out of the terminal station. This composite layout includes the longest length (Beale Street Station) plus restrictions on crossover locations and speeds imposed by a twin-bore tunnel. A schematic diagram of the composite track layout and speed restrictions is shown in Appendix A.

A double-tracked line signalled for operation in either direction on either track from the present JPB line near Seventh and Hooper to the new station has been assumed. As used elsewhere on the JPB line, track switches would be powered with electric motors and typical railroad color light signals would be used. For operating flexibility, a universal crossover was assumed near Sixth Street. At the station, switches and crossovers would be arranged to allow trains to use any station platform track from either of the main tracks. Signalling was assumed to be consistent with current railroad practice for new construction, e.g., Centralized Traffic Control (CTC) with a signal control system operated by the JPB dispatcher, is planned. The signal system would allow trains to safely operate closely behind one another to minimize the effect of minor schedule aberrations.

4.2 Operating Capacity Analysis Methodology

Two computer spreadsheet models were used to evaluate the number of terminal tracks required to accommodate the assumed peak hour demand described in Section 4.1. The test case for the model runs assumed three tracks in the terminal station for CalTrain service. Other inputs to the models included assumed train sizes, operating parameters (e.g., train speeds, allowable distances between trains, etc.), and the period of time that each train must be at the platform to discharge and load passengers.

The first spreadsheet model, labeled *ctetimes*, partitioned the track into 10-foot increments. Each increment was assigned a track speed limit. Using a conservative simplified assumption of one mphps (mile per hour per second) for braking and acceleration, speeds were calculated for each segment of track in each direction. The second spreadsheet model, labeled *cteprosc*, used as input the assumed train schedules and calculated track occupancy times. (A computerized train simulation model will be run later in the study when track geometrics and speed restrictions have been more precisely defined.)

4.3 Model Results and Conclusions

Results of the spreadsheet model runs show that the assumed CalTrain service (i.e., nine 10-car trains in the peak direction and four 4-car trains in the opposite direction, all evenly distributed during the peak hour) theoretically could be accommodated on three platform tracks.

Uneven distribution of the trains during the peak hour, as exists with the current schedule, would require an additional fourth track. The current peak period schedule, with seven inbound and four outbound trains between 7 and 8 AM, requires four tracks because four trains arrive within a period of 19 minutes.

In addition, the model runs represent a theoretical operation with no allowances for schedule delays or disruptions. To provide for reasonably consistent train operations, the terminal must contain provision for schedule disruptions, even if infrequent in nature. Small disruptions in an established schedule can produce significant variations in performance. Since trains must arrive, turn and depart within a short time interval, late arrivals or excess terminal station dwell times (time at the platform) would produce late departures. This would in turn affect inbound trains, which would not have clear signals, given that a platform track would not be available. Inbound trains therefore would have to be held outside the terminal until a terminal track became available.

During peak periods, when track and platform occupancy may be 70 to 85 per cent of the theoretical capacity, disruptions would extend at least through the end of the peak period. A 15-minute late train could be expected to delay other trains three to six minutes for about half an hour, assuming that the current JPB practice of having a "protect" crew and train available to provide the turn for the late train.

Should disruptions occur during off-peak periods, there would generally be a shorter-term effect, as frequency of the arriving trains diminishes. However, proposed increased levels of mid-day service would reduce the ability to recover.

It is clear that an additional fourth terminal track would provide additional operating flexibility and greatly enhance the capability to accommodate schedule delays and disruptions, and a minimum of four tracks in the terminal station is therefore deemed prudent and necessary to operate CalTrain commuter service under real-world situations.

The train scheduling and platform occupancy analysis is shown in Appendix A. Once the number of alignment options has been narrowed and preliminary design for these options

has been completed, a more detailed operations plan will be developed using a computerized train simulation model.

4.4 Physical Site Constraints

4.4.1 Market/Beale Street Terminal

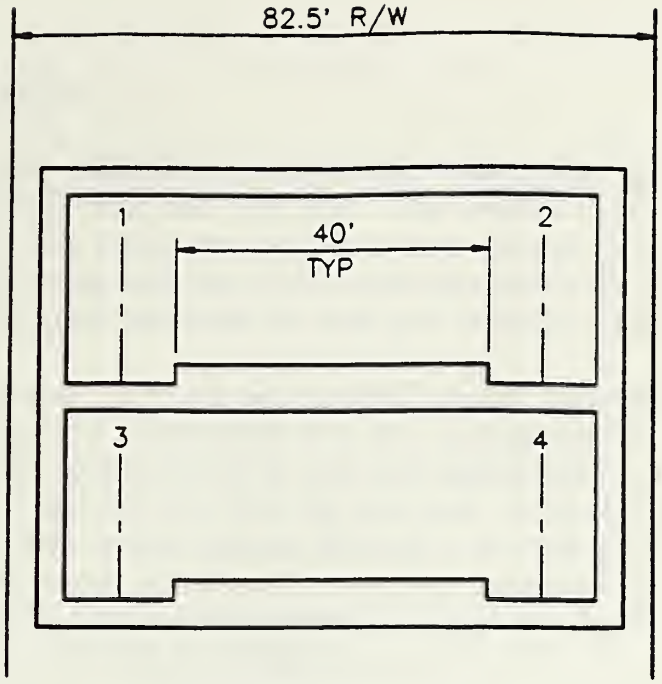
As outlined in Section 3.1, there are three design options under consideration for the Market/Beale terminal station. The first design option consists of a three-level terminal located in a subway under Beale Street, extending from its northern stub-end at Market Street south to about halfway between Mission and Howard Streets. In this location, the Beale Street 82.5-foot wide right-of-way is bounded by high rise buildings on both sides. This width restriction creates a practical limitation of two tracks (per level) that can be physically accommodated. With two tracks per level, a number of platform layouts are possible for each train level, e.g., one 40-foot center platform or two exterior 20-foot side platforms (See Figure 2).

To reduce construction impacts on adjoining properties and sidewalks at the Market/Beale station location, narrower platforms could be used. However, these narrower platforms would not function as well in terms of necessary vertical circulation and passenger flows. Placement of three tracks on one level in this right-of-way width would result in platform widths (17 feet) that are too narrow under current codes to accommodate the anticipated maximum passenger loadings and the facilities needed for vertical circulation. A more detailed platform capacity analysis will be performed during later design phases of the project, once the number of station options has been reduced.

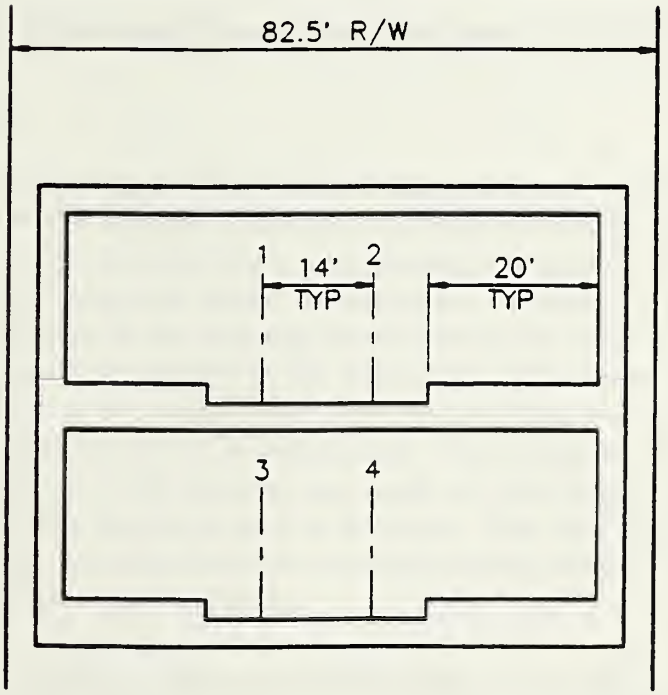
Two levels of train tracks would permit a maximum of four terminal tracks for this Market/Beale design option. Given the additional horizontal space available south of Mission Street for the other two design options at the Market/Beale location (i.e., the two-level options), four tracks would be possible on the one train level directly under the mezzanine.

For the second and third design options, all tracks would be located on one underground level with a mezzanine (also underground) above. For these options, two CalTrain tracks would be located within the Beale Street right-of-way and two tracks would be located to the east of Beale Street under the currently vacant Caltrans property between Beale and Main Streets. Given the additional horizontal space available for these two Market/Beale design options, four tracks would be possible on the one train level directly under the mezzanine.

Under all three design options for the Market/Beale terminal, additional tracks (beyond the four required for CalTrain operations) could be build underground in the area between Beale and Main Streets, e.g., to accommodate intercity service (See Section 7).



CENTER PLATFORM



SIDE PLATFORM

FIG. 2 BEALE STREET TERMINAL
ALTERNATIVE CONFIGURATIONS

4.4.2 Transbay Terminal

The Transbay Terminal, which is currently used by buses, was originally built in 1938 for interurban electric trains from the East Bay. The original configuration consisted of a "through" station (i.e., the trains operated on a loop through the station) with six tracks. Platforms were 700 feet long, with two 15-foot-wide side platforms for the two outside tracks and two 28-foot-wide center platforms for each pair of inside tracks.

Design configurations under consideration for the Transbay Terminal site include demolition of the current structure and construction of a new underground or aerial CalTrain station on the same site. Both options would be stub-end stations with 1,000-foot long platforms, and trains would enter and exit only from the west end. A maximum of six tracks could be accommodated in the new station options, although a six track arrangement would require platform widths that would significantly constrain passenger movement and vertical circulation capabilities and are not recommended. Preliminary Transbay Terminal track and platform configurations are shown in Figure 3.

A more detailed platform capacity analysis will be performed during later design phases of the project, once the number of station options has been reduced.

5. EFFECTS OF THE NUMBER OF TRACKS ON CALTRAIN OPERATIONS

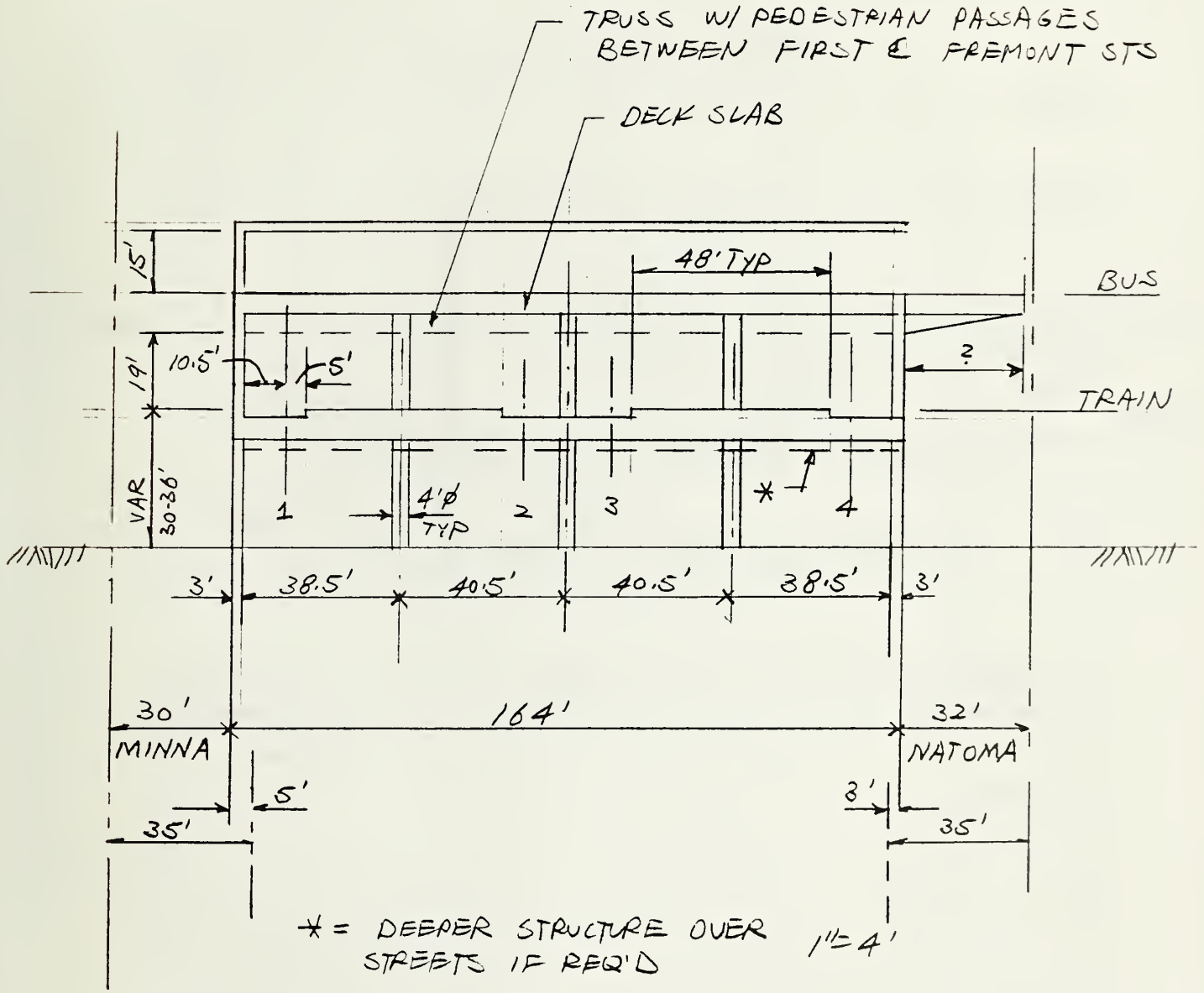
5.1 Train Storage

A maximum of four to six tracks at the terminal stations would not allow for sufficient mid-day storage of trains in the station. Currently CalTrain utilizes all twelve surface tracks at the Fourth and Townsend terminal for a combination of midday revenue service, midday storage, and midday cleaning and minor maintenance. Trains and portions of trains that would not make return trips in the morning would have to be taken to mid-day storage, and reverse train moves would be needed in the afternoon. Alternative storage yard locations are being studied as part of the overall environmental analysis, but at this point, the specific location of a storage yard has yet to be determined. Two locations are under consideration: (1) an area just east of the I-280 freeway and north of 16th Street; and (2) JPB's right-of-way adjacent to the former Bayshore yard in Brisbane. The 16th Street storage yard option would be approximately two miles from the terminal station, while the Brisbane storage yard option would be some seven miles distant.

Configuration of the storage yard and track leads may have some impact on main line CalTrain schedules and operations, but the capacity of the terminal should not be affected. To the extent that deadheading occurs for trains and portions of trains to the storage yard, CalTrain operating costs will increase as the distance to the storage yard increases. Thus, selection of the Brisbane option would produce somewhat higher CalTrain operating costs - approximately $1.9 million vs $1.4 million per year.

FIGURE 3

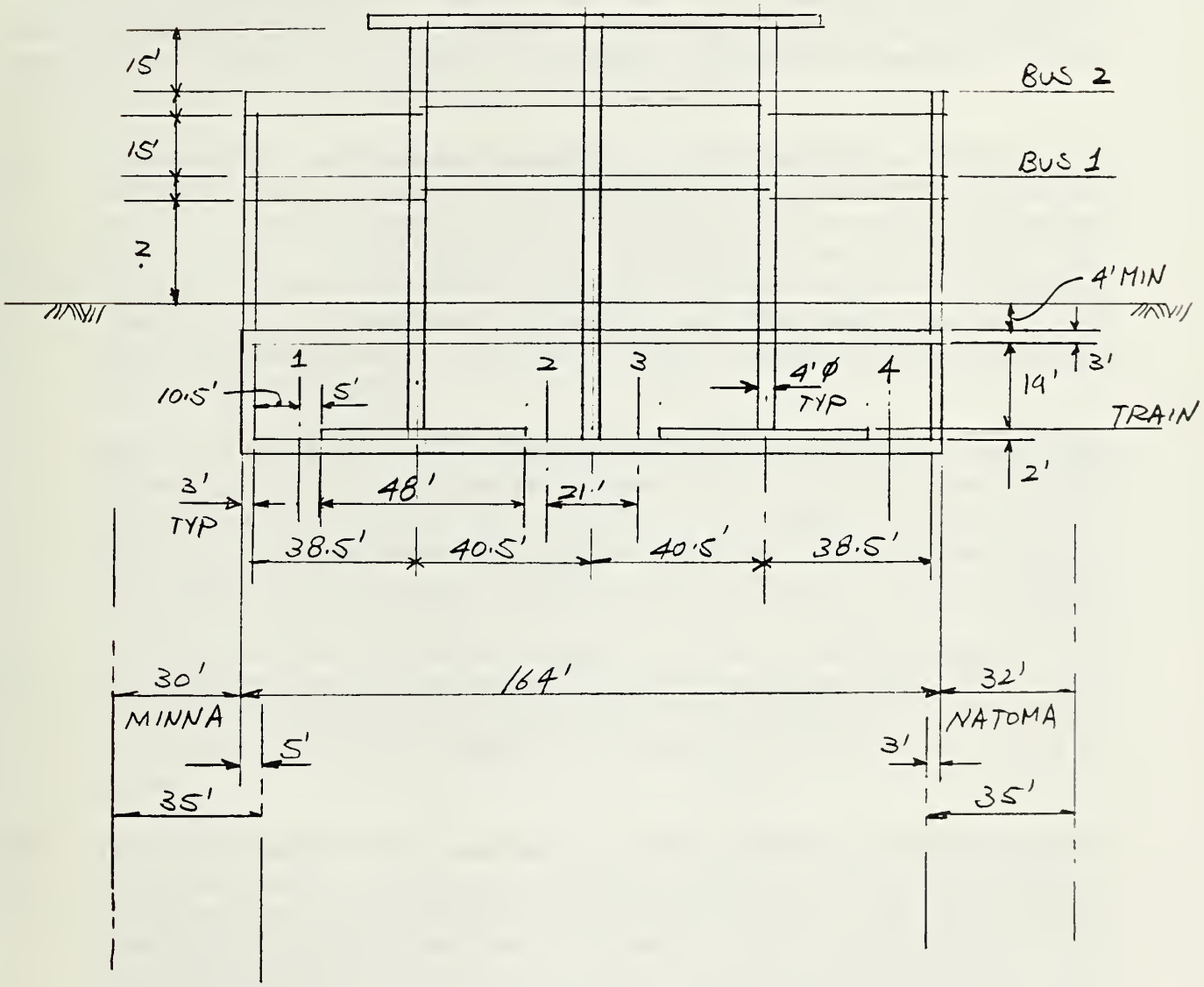
POSSIBLE AERIAL CALTRAIN STATION AND BUS FACILITY AT TRANSBAY TERMINAL SITE



NOTE : COLUMNS FOR BUS DECK ROOF SUPPORT NOT SHOWN

FIGURE 3 (Continued)

POSSIBLE UNDERGROUND CALTRAIN STATION AND BUS FACILITY AT TRANSBAY TERMINAL SITE



5.2 Changes to Train Sizes

Trains sizes may be varied in response to peak hour and directional demands. Limitations on the maximum number of tracks at the new terminal station will make it more difficult to change the size (consist) of the trains, and incoming trains and/or train cars will either have to turn as revenue trains or be deadheaded to the nearest storage yard.

For the new terminal station, three general options exist for changing the train consist to match directional and peak/non-peak demand. A fourth option would be to not change train sizes. To reduce operational disruption, JPB staff recommend that changes to the train consist not occur in the terminal station or on the main line.

- **Trains could be split (reduced in length) at the terminal station.** After the train unloads its inbound passengers, a cut (uncouple) could be made to the desired train length. The required brake test could be performed and the outbound passengers could be loaded. A switch engine would be scheduled from the storage yard to arrive soon after the shortened train had departed. The switch engine would couple the remaining cars and take them to the storage yard. The reverse operation would occur to lengthen the trains, with the switch engine bringing cars to the terminal just ahead of the arriving train.

  While this operation would minimize total CalTrain car-miles, it has several disadvantages: (1) it likely would require more crews and switch engines than exist at present; (2) it may require ADA capability at two platform locations; and (3) it would increase the utilization of the terminal station tracks with a resultant decrease in the ability to recover from a schedule disruption. Based on the train operation simulation model runs discussed in Sections 4.2 and 4.3, a 10-car train arriving full and turning as a four-car train would require 16 minutes of platform track occupancy time, including time to allow best possible signals entering the station. (Note that a 10-car train arriving full and then deadheading from the terminal to the storage yard would require 9.5 minutes of platform track time.) JPB staff do not recommend this option.

- **Trains could be split on the main line at a station or location near the storage yard.** Under this scenario, a switch engine would be used to take the cars off and add cars on the main line. This approach would minimize overall car-miles, and additional crews and switch engines may not be needed. However, this approach has the potential to delay trains when adding cars; and it may require ADA capability at two platform locations at the downtown terminal. JPB staff do not recommend this option.

- **Train size changes could be made at San Jose.** While this approach creates no additional ADA facility requirements, it does present several disadvantages: (1) it is likely to increase crew or switch engine requirements; (2) it would add to the total CalTrain car-miles; and (3) it may appear inefficient (with the likelihood of empty cars running to and from San Jose).

- **The consist could remain the same all day.** This approach eliminates switching requirements and associated costs. However, it would generate additional CalTrain car-miles with associated operating cost increases, and it would appear inefficient with empty or near empty cars headed in the non-peak direction. It should be noted that increases in reverse commute trips (from San Francisco to San Jose in the AM) would make this scenario more advantageous.

With careful scheduling, long peak-hour trains could be routed to mid-day storage and short peak-hour trains could be used for reverse peak service, representing a significant reduction in car-miles. JPB staff recommend that this options be pursued.

6. TERMINAL STATION PLATFORM CONFIGURATION OPTIONS

6.1 Types of Platform Configurations

There are generally three platform configurations possible at the two terminal sites. Each configuration has implications with respect to cost and passenger flows.

- **Center platforms**, with a track on each side of the platform, would require a single set of passenger vertical circulation facilities (stairs, escalators and elevators) for each pair of tracks. Directing passengers to the proper platform serving two tracks would require less signage than single-track platforms. However, passengers going to or from one track would mix with passengers to or from the other track, and flow could be impeded. In addition, it is not possible to control passenger flows to and from one train with a center platform. Moreover, the tracks approaching the center platform would need to be spread apart, and this additional width would increase the length and construction cost of the approach track.

- **Side platforms**, with access to one track per platform, would require more passenger vertical circulation facilities than do center platforms. Passenger orientation is also more complicated, and passengers who go to the wrong track would need to then go back up to the mezzanine level to access another platform. There is no passenger interference from other trains on the side platforms, and passenger flows can be more easily controlled, given that access is provided to only one train at a time.

- **A single track with platform edges on both sides** represents a third possible configuration. One or both of the platforms would be shared with another track (as with a center platform). The single-track, two-platform configuration would provide an opportunity for fast and efficient passenger control, by directing alighting passengers to one of the platforms, while passengers waiting to board are held on the other platform on the other side of the train. Doors on the alighting side of the train would be kept closed until the train is empty. This arrangement eliminates passenger interference and could minimize train turnaround time; however, it would require more platform space and a wider terminal, which would increase construction costs.

CalTrain operations staff recommend that center platforms be utilized for this phase of the study. Platform configuration is not as critical an element as the number of tracks, so

changes can be made at later stages of this project without significantly affecting impacts or feasibility.

6.2 Passenger Flow Controls

It is desirable to control passenger flows, particularly within the terminal station. Such controls can minimize operational costs, increase security by closing off areas that are not needed or used during off-peak periods, and facilitate passenger movements by providing clear and efficient circulation. Passenger flow control requires physical facilities such as doors or gates, as well as personnel or other means to operate them.

At the present terminal, there is only one access gate to each platform, and each gate is located about 40 feet from the next. Passenger control is relatively easy and inexpensive with this arrangement. With a new downtown terminal, passenger control will be more complicated. Passenger destinations will be both north and south of the Market/Beale Station options, and both east and west of the Transbay Terminal options. Multiple points of access both to and from each platform will be desirable.

Passenger flow controls and train schedules would need to be developed in conjunction with the physical layouts of the platform access points. The following provisions could be incorporated into the station design to provide passenger control between various levels of the terminal:

- Station passenger entrances could consist of an architectural enclosure, including provisions for closing off access to the station at the street level during non-operating hours or in emergencies.

- Reversible escalators with automatic shut-off if no activity occurs could be provided to facilitate passenger movement during peak periods.

- Vertical circulation elements could be grouped in "blocks" to allow easy control of both escalators and stairs. Gates, stanchions or other facilities could be provided at each of these blocks at the various levels to allow lower levels to be secured or to direct passengers to a particular circulation element.

- Vertical circulation elements could be stacked to provide direct circulation among all levels.

- Audible and visual directions could be provided through public address announcements and directional signs to direct passengers to the appropriate vertical circulation elements and platforms.

As an example of how passenger control might work, vertical circulation would be configured together in a block consisting of stairs and escalators. During peak inbound periods, most of the escalators would be in the "up" direction. One block consisting of one stair and one escalator could be designated as "down" for outbound passengers. Signs and announcements would direct passengers to the appropriate blocks, either "up" or "down." The "down" block

could also be secured to hold passengers until the platform is sufficiently cleared of incoming passengers. During the afternoon peak, the directions of the blocks would be reversed.

6.3 ADA Requirements and Emergency Evacuation

Requirements of the Americans with Disabilities Act (ADA) must be addressed in the design of the proposed new CalTrain stations. In general, ADA requires that disabled individuals be provided access throughout the station, including access to any public services that are part of the station, to station platforms and into the vehicles. Fully accessible elevators or ramp systems must be provided from an accessible area to the mezzanine and station platforms. Spaces must also be provided inside the vehicle for the disabled individual to be positioned and these spaces must conform to accessibility guidelines for a wheelchair.

The following major areas are likely to be subject to review as part of the ADA station evaluations: site access, passenger loading zones, parking areas, curved ramps, entry/exit doors and interior doors, corridors and accessible routes, audible and visible warning signals, ramps, stairs, elevators, drinking fountains, toilet rooms, alarms, detectable warnings, signage, ticketing machines, ticketing/information booths, and telephones.

To accommodate disabled passengers during normal operations, CalTrain currently designates the second car from the north end of all trains as the ADA accessible car. Although the car itself is not currently accessible, the JPB is now using a hand-operated lift to provide access to the car, similar to that used by Amtrak.

For emergency evacuation, elevator systems of a new station would be shut down so that fire department personnel could use them for access. Therefore, to evacuate disabled persons from the mezzanine or station platform levels of a new station, manual assistance would need to be provided to carry those persons to a safe point outside of the station. To achieve this, 5-6" minimum width stairs must be provided to allow for the disabled person and one person on each side of the disabled person in order to carry them. In addition, JPB personnel would be required to receive training as part of an emergency response protocol.

No significant impacts on exiting or dwell times are anticipated for disabled access and circulation. When operating at train capacity, some additional time to clear the ADA car can be anticipated; however, the actual time to clear the platform is not expected to be significantly altered by disabled passenger usage.

7. INTER-CITY PASSENGER TRAIN SERVICE

Current passenger train service along the Peninsula corridor north of San Jose consists of commuter service only. Since 1971 there has been no intercity passenger rail service.

Intercity rail service in the United States is the responsibility of the National Railroad Passenger Corporation (Amtrak). The JPB is authorized to run commuter service only, and the object of the downtown extension study is to determine the optimum location for the commuter rail terminal. Nevertheless, there is considerable interest by intercity passenger rail advocates to include, or at least not preclude, a provision for future intercity rail trains

at the new terminal sites. Therefore the potential for the provision of future intercity rail passenger trains has been included in this analysis.

7.1 Possible Intercity Train Track Locations

Intercity train service could be located on additional tracks located beyond the four required for CalTrain. It appears that these additional tracks could be constructed adjacent to either of the terminal sites, but policy decisions would be necessary to preserve the existing land for such possible use.

The current Transbay Terminal site can accommodate six tracks, although a six-track arrangement would require platform widths that would significantly constrain passenger movement and vertical circulation capabilities. It is also possible that additional tracks could be added on the south side adjacent to a new CalTrain station at the Transbay Terminal site by extending the terminal under or over Natoma Street, possibly into the properties on the north side of Howard Street.

With the Beale Street alignments, a future two- or four-track intercity train terminal could be constructed underground on the east side of Beale Street ending south of Mission Street. A separate lead track would connect to the CalTrain subway tracks in the vicinity of Harrison Street near the U.S. Post Office Building.

As part of the terminal design options analysis, the ability to add two to four tracks for intercity/high speed rail is being evaluated for all five terminal station design options under consideration, including a calculation of platform lengths for all platforms.

7.2 Intercity Train Platforms

The typical CalTrain commuter passenger and the typical intercity rail passenger differ in their needs and requirements and the manner in which planning for the station must occur. Typical commuters are familiar with the station and transit system, can navigate the station easily, require minimal amenities, and carry little if any luggage. Typical intercity passengers will have luggage of some kind, may not be familiar with the station and the station area, and will probably require some assistance with transportation connections upon exiting the station. In addition, intercity trains may be carrying freight, mail or other non-passenger related materials which require special handling.

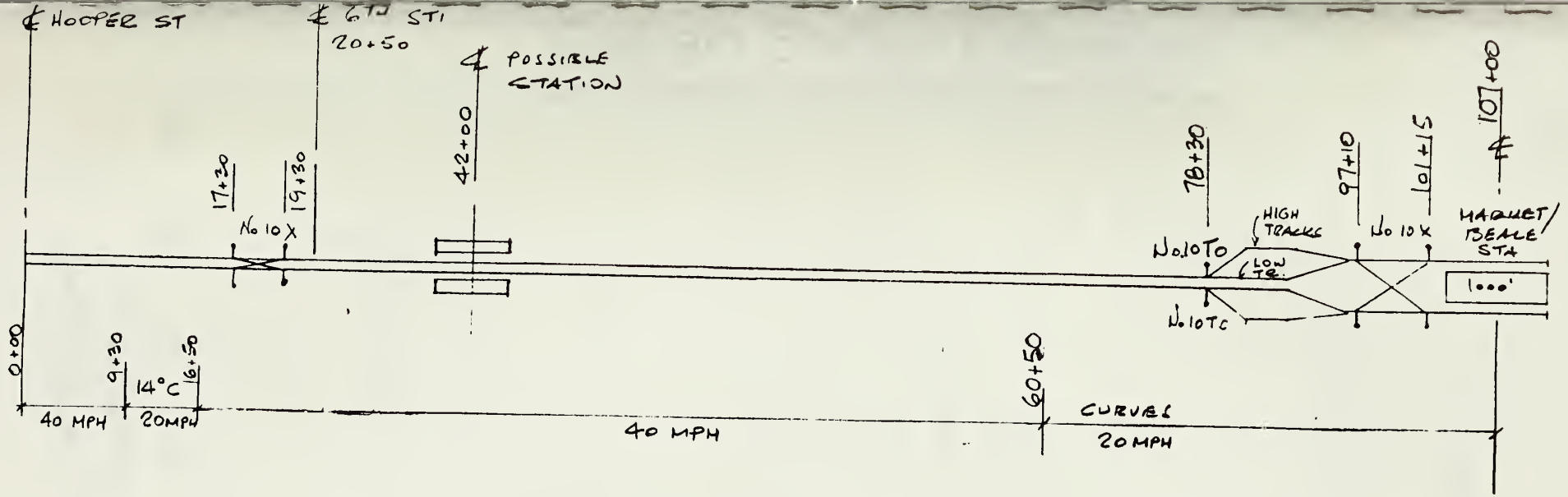
In terms of exiting and circulation requirements, intercity passengers would necessarily spend more time on the station platform and in the station itself. In addition, because of luggage and other carry-on items, normal circulation would require additional platform area per passenger to be comfortable. An emphasis on utilization of the escalators and heavier usage of the elevator or elevators would be anticipated.

8. FUTURE MISSION BAY STATION

Although not currently included in the CalTrain extension program, there is a desire to provide for a possible station to serve Mission Bay if passenger demand materializes at some future date. Track geometry has been designed to accommodate such a station.

The operations analysis performed as part of this study included a provision, in terms of travel time, for this intermediate station. Provisions for this station have minimal impact on operations at a new end-of-line terminal, given that the Mission Bay station would be located south of the intermediate signal, which is part of the assumed track and signal configuration for the terminal approach tracks. A Mission Bay Station would increase running times for all trains that stop there and could limit line capacity if dwell times were longer than approximately one minute.

Appendix A: Train Schedule and Track Occupancy Calculations



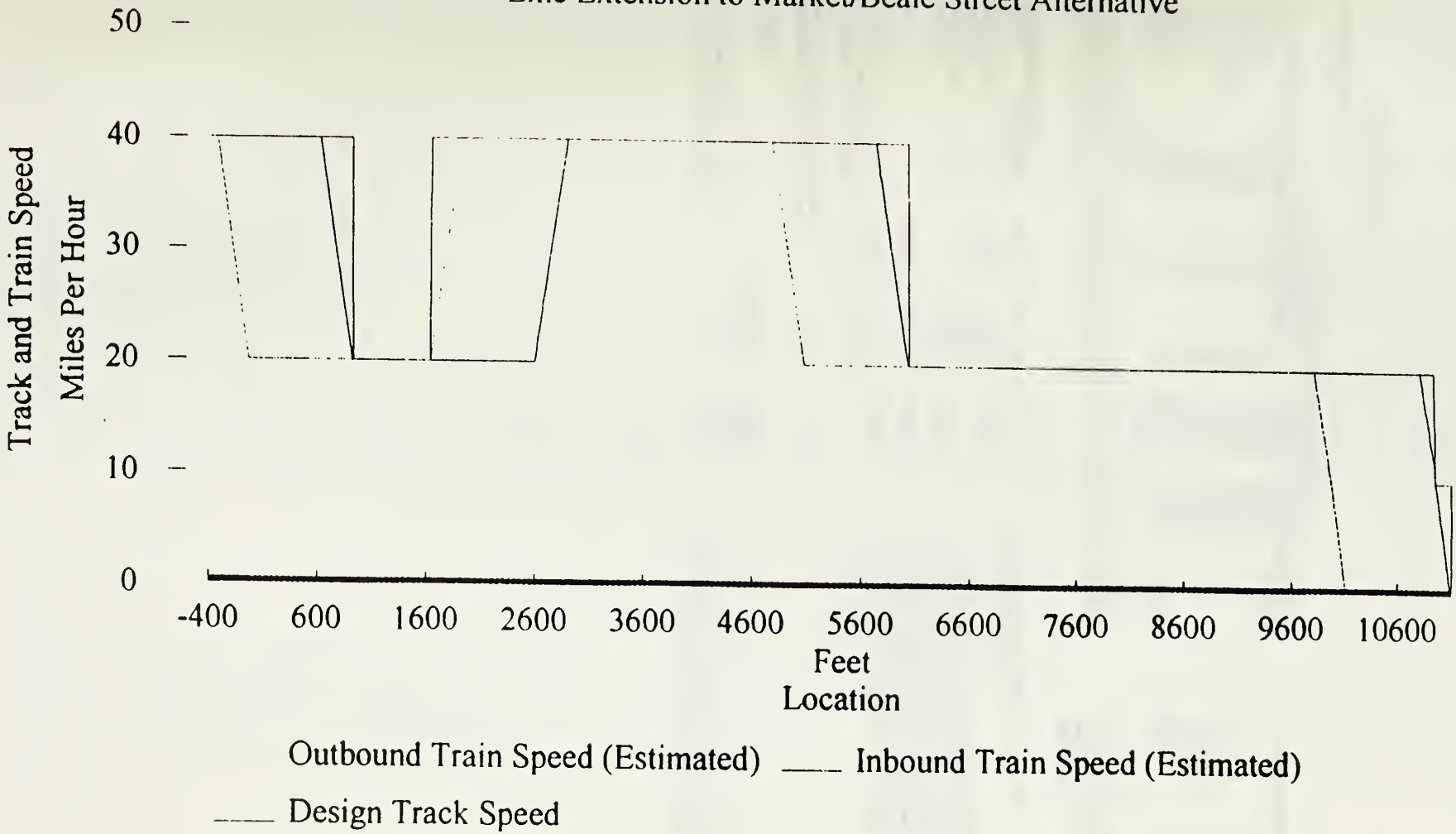
NOTE No. 10 CROSSOVER BETWEEN STA 17+30 TO 19+60 CAN BE RELOCATED NORTH OF THE POSSIBLE STATION, ANYWHERE BETWEEN STA. 50+00 AND STA. 59+00

MARKET/BEALE ST ALTERNATIVE
CUT & COVER UNDER BEALE, EMBARCADERO AND TOWNSEND

SCHEMATIC TRACK CHART
NTS 6/2/95

Caltrain Station Extension

Line Extension to Market/Beale Street Alternative



Alignment data from ICF-KE June 2, 1995

Input Parameters

Running Times

Location		Accumulative Train Running Times in Decimal Minutes		Accumulative Train Running Times in Minutes and Seconds		
Name	Station	Inbound	Outbound	Inbound	Outbound	Clearing Time
Approach	-400	0.0	4.9	00:00:00	00:04:56	00:00:16
S Universal	1730	0.9	3.8	00:00:52	00:03:49	
N Universal	1930	1.0	3.8	00:00:59	00:03:46	
Intermediate	4660	2.4	2.9	00:02:22	00:02:55	
S Split	7830	3.7	1.3	00:03:44	00:01:18	
N Split	8030	3.9	1.2	00:03:51	00:01:11	
S Station	9710	4.8	0.2	00:04:49	00:00:14	
N Station	10115	5.0	0.0	00:05:02	00:00:00	00:00:31
S Post	11110	5.8		00:05:46		

Decimal Minutes are from worksheet "clastimes.wk3" Conversion is made from decimal minutes to times for schedule development. Times are developed for head end of train, and clearing time, e.g. time for the train to pass a point is added, based on train length and speed.

Typical Schedules	Inbound	Outbound
Approach	06:54:14	07:15:11
Universal	06:55:38	07:14:20
Intermediate	06:56:51	07:13:11
Split	06:58:20	07:11:49
Station	06:59:46	07:10:45
Post	07:00:00	07:10:00

Running times are based on the schematic diagram representing the "worst" composite of the station location alternatives.

Station Dwell Times

Station Activity	Unit Times (decimal minutes)	REV-DH DH	REV-REV REV	DH-REV REV
Minimum Dwell	5.0	00:05:00	00:05:00	00:05:00
Unloading	4.5	00:04:30	00:04:30	
Platform Cycle	1.0		00:01:00	
Loading	5.5		00:05:30	00:05:30
Total		00:05:00	00:11:00	00:05:30
Track Clear	4.0	00:04	00:04	00:04

A platform track is clear so that a clear signal can be displayed at Intermediate for an inbound train.

Time for Inbound DH Equipment to arrive before inbound train to couple to arrives 00:10

<<< Train type shown as INBOUND-OUTBOUND
<<< OUTBOUND train type

Three types of train operation are analyzed. A train may arrive in revenue service, and then depart deadhead, or arrive as a deadhead and depart as a revenue train with no consist change. A train arriving and departing as a revenue train is assumed to change size, either by adding or dropping cars from the consist. A switch engine, designated P7 moves the added or dropped cars to or from the station.

Outputs

	Number of JPB Tracks	Percent Utilized
Station Tracks Required - AM Peak	3	67.8%
Station Tracks Required - PM Peak	3	76.1%

The Percent Utilized is computed by dividing the number of minutes during the peak hour that each track is utilized by the maximum number of tracks times 60 (minutes).

Proposed AM Schedule

Inbound

10 trains per hour, or one train every 00 06 minutes

Assumes that all passengers unloading can do so, and that all passengers loading are on the platform three minutes before departure time.

Train	1	3	5	7	P1	9	11	13	P2	15	17	19	P3	21	23	25	P4	27	29	31	33	35
Equipment	REV-DH	REV-DH	REV-DH	REV-REV		REV-DH	REV-DH	REV-REV		REV-DH	REV-DH	REV-REV		REV-DH	REV-DH	REV-REV		REV-DH	REV-DH	REV-DH	REV-DH	REV-DH
Approach	06 54 14	07 00 14	07 06 14	07 12 14	07 27 14	07 18 14	07 24 14	07 30 14	07 45 14	07 36 14	07 42 14	07 48 14	08 03 14	07 54 14	08 00 14	08 06 14	08 21 14	08 12 14	08 18 14	08 24 14	08 30 14	08 36 14
Universal	06 55 28	07 01 28	07 07 28	07 13 28	07 28 28	07 19 28	07 25 28	07 31 28	07 46 28	07 37 28	07 43 28	07 49 28	08 04 28	07 55 28	08 01 28	08 07 28	08 22 28	08 13 28	08 19 28	08 25 28	08 31 28	08 37 28
Intermediate	06 56 51	07 02 51	07 08 51	07 14 51	07 29 51	07 20 51	07 26 51	07 32 51	07 47 51	07 38 51	07 44 51	07 50 51	08 05 51	07 56 51	08 02 51	08 08 51	08 23 51	08 14 51	08 20 51	08 26 51	08 32 51	08 38 51
Split	06 56 20	07 04 20	07 10 20	07 18 20	07 31 20	07 22 20	07 28 20	07 34 20	07 49 20	07 40 20	07 46 20	07 52 20	08 07 20	07 58 20	08 04 20	08 10 20	08 25 20	08 19 20	08 22 20	08 28 20	08 34 20	08 40 20
Station	06 59 46	07 05 46	07 11 46	07 17 46	07 32 46	07 23 46	07 29 46	07 35 46	07 50 46	07 41 46	07 47 46	07 53 46	08 08 46	07 59 46	08 05 46	08 11 46	08 26 46	08 17 46	08 23 46	08 28 46	08 35 46	08 41 46
Post	07:00:00	07:06:00	07:12:00	07:18:00	07:33:00	07:24:00	07:30:00	07:36:00	07:51:00	07:42:00	07:48:00	07:54:00	08 09 00	08:00:00	08:06:00	08:12:00	08:27:00	08:18:00	08:24:00	08:30:00	08:36:00	08:42:00
Track																						
Train	1	3	5	7	P1	9	11	13	P2	15	17	19	P3	21	23	25	P4	27	29	31	33	35
Station Dwell	00 05 00	00 05 00	00 05 00	00 11 00	00 05 00	00 05 00	00 05 00	00 11 00	00 05 00	00 05 00	00 05 00	00 11 00	00 05 00	00 05 00	00 05 00	00 11 00	00 05 00	00 05 00	00 05 00	00 05 00	00 05 00	00 05 00
Begin Track Use	06 56 00	07 02 00	07 08 00	07 14 00	07 29 00	07 20 00	07 26 00	07 32 00	07 47 00	07 38 00	07 44 00	07 50 00	08 05 00	07 56 00	08 02 00	08 08 00	08 23 00	08 14 00	08 20 00	08 26 00	08 32 00	08 38 00
End Track Use	07 05 45	07 11 45	07 17 45	07 29 45	07 38 45	07 29 45	07 35 45	07 47 45	07 56 45	07 47 45	07 53 45	08 05 45	08 14 45	08 05 45	08 11 45	08 23 45	08 32 45	08 23 45	08 29 45	08 35 45	08 41 45	08 47 45
Total Use	00 09 45	00 09 45	00 09 45	00 15 45	00 09 45	00 09 45	00 09 45	00 15 45	00 09 45	00 09 45	00 09 45	00 15 45	00 09 45	00 09 45	00 09 45	00 15 45	00 09 45	00 09 45	00 09 45	00 09 45	00 09 45	00 09 45

Outbound

Train	2	4	6	8	P1-DH7	10	12	14	P2-DH13	16	18	20	P3-DH19	22	24	26	P4-DH25	28	30	32	34	36
Equipment	DH	DH	DH	REV		DH	DH	REV		DH	DH	REV		DH	DH	REV	REV	DH	DH	DH	DH	DH
Approach	07 10 11	07:19 11	07 22:11	07:34:11	07 43 11	07 34 11	07 40 11	07 52 11	08 01 11	07:52 11	07:58 11	08 10 11	08 19 11	08 10 11	08 19:11	08:28:11	08:37:11	08 28:11	08:34:11	08:40:11	08:46:11	08 52 11
Universal	07 08:20	07:15 20	07:21 20	07:33 20	07 42 20	07 33 20	07 38 20	07 51 20	08 00 20	07 51:20	07 57:20	08:09 20	08 18 20	08 08 20	08:15 20	08:27 20	08:36:20	08:27:20	08:33:20	08:39:20	08 45:20	08 51:20
Intermediate	07 08:11	07 14 11	07 20:11	07 32:11	07 41:11	07 32 11	07 38 11	07 50 11	07 59 11	07 50 11	07 56 11	08 08 11	08 17 11	08 08 11	08:14:11	08 26.11	08:35.11	08:26:11	08:32:11	08:38:11	08 44:11	08 50:11
Split	07 08:49	07 12 49	07 18 49	07 30 49	07 39 49	07 30 48	07 36 48	07 48 49	07 57 48	07 48 49	07 54 49	08 06 48	08 15 49	08 06 48	08:12:49	08:24:49	08:33:48	08 24 49	08 30:49	08 36:49	08 42:49	08 48 48
Station	07 05 45	07 11 45	07 17 45	07 29 45	07 38 45	07 29 45	07 35 45	07 47 45	07 56 45	07 47 45	07 53 45	08 05 45	08 14 45	08 05 45	08:11:45	08:23 45	08:32:45	08 23 45	08 29 45	08 35 45	08:41:45	08 47 45
Post	07 05 00	07 11 00	07 17 00	07 29 00	07 38 00	07 29 00	07 35 00	07 47 00	07 56 00	07 47 00	07 53 00	08 05 00	08 14 00	08 05 00	08 11 00	08 23 00	08 32:00	08:23 00	08 29 00	08 35 00	08 41 00	08 47 00
Track										4	5	6		6	6	6	6	9	9	6	6	6
Train	2	4	6	8	P1-DH7	10	12	14	P2-DH13	16	18	20	P3-DH19	22	24	26	P4-DH25	28	30	32	34	36

Proposed PM Schedule

Inbound

10 trains per hour, or one train every 00 06 minutes

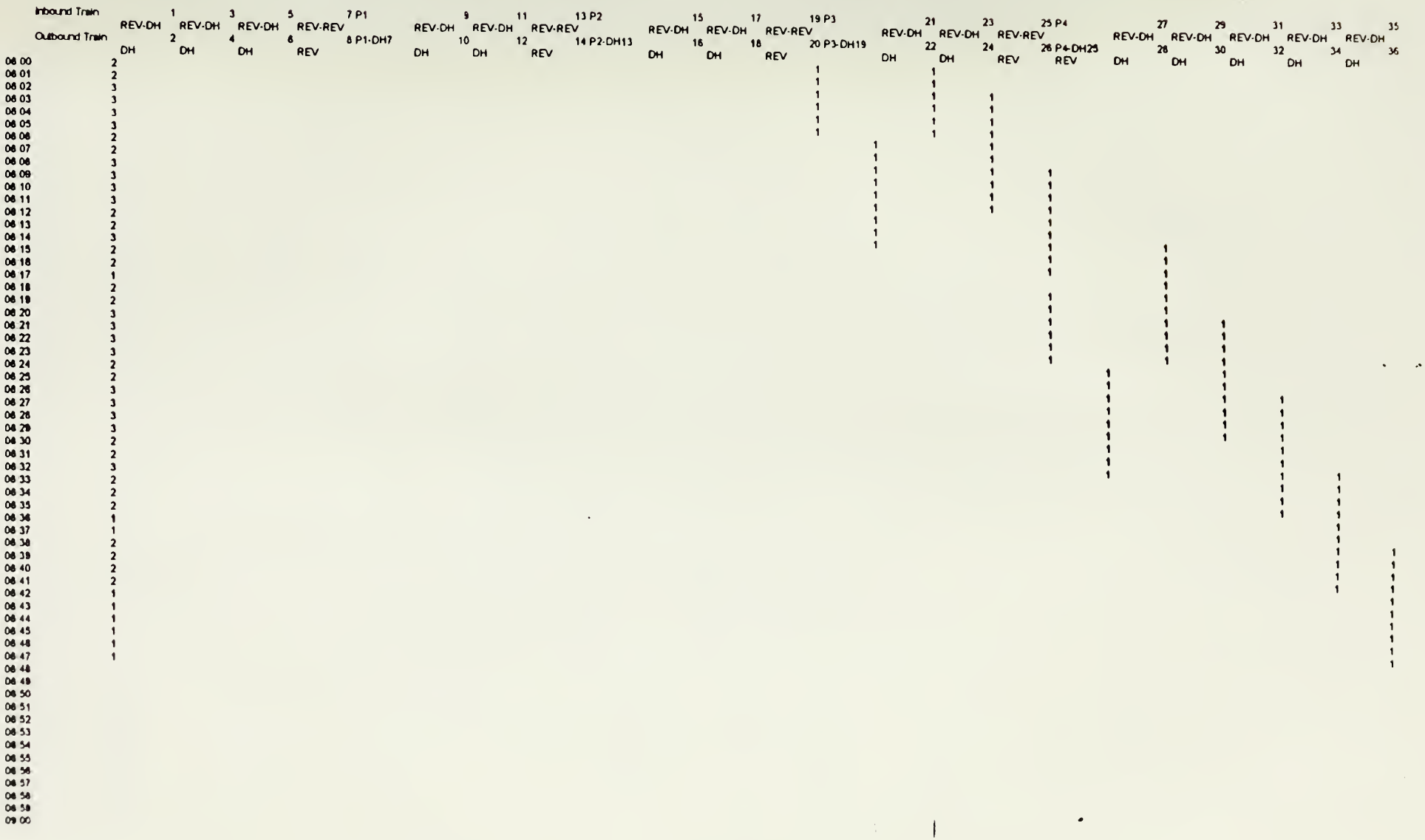
Train	49	51	53	55	P1-DH-56	57	59	61	P2-DH-64	63	65	67	P3-DH-68	69	71	P4-DH-76	73	75	77	79	81	83
Equipment	REV-REV	DH-REV	DH-REV	REV-REV		DH-REV	DH-REV	REV-REV		DH-REV	DH-REV	REV-REV		DH-REV	DH-REV		DH-REV	REV-REV	DH-REV	DH-REV	DH-REV	REV-REV
Approach	15 43 14	15:54:44	16 00:44	16 01:14	15 51 14	16 12 44	16 18 44	16 19 14	16 09 14	16 30:44	16 36 44	16 37:14	16 27 14	19 46 44	19 54:44	19 51:14	17 00:44	17 01:14	17:12:44	17:18:44	17:24 44	17 25:14
Universal	15 44 28	15:55 58	16 01:58	16 02 28	15 52 28	16 13 58	16 19 58	16 20 28	16 10 28	16 31:58	16 37 58	19 38 28	16 28 28	16 49 58	19 55:58	16:52:28	17 01 58	17 02:28	17:13:58	17:19:58	17:25:58	17:26 28
Intermediate	15 45 51	15 57 21	16 03 21	16 03 51	15 53 51	16 15 21	16 21 21	16 21 51	16 11 51	16 33 21	16 39 21	16 39 51	16 29 51	19 51 21	19:57:21	19:53:51	17 03 21	17 03:51	17:15:21	17:21:21	17:27:21	17:27 51
Split	15 47 20	15 58 50	16 04 50	16 05 20	15 55 20	16 16 50	16 22 50	16 23 20	16 13 20	16 34 50	16 40 50	19 41 20	16 31 20	16 52:50	19 58:50	19:55:20	17 04:50	17 05:20	17:19:50	17:22:50	17:28 50	17:29 20
Station	15 46 48	16 00 18	16 06 19	16 06 46	15 56 46	16 18 18	16 24 18	16 24 48	16 14 46	16 36 18	16 42 18	18 42 46	16 32 46	19 54 18	17:00:19	19 56:46	17 06:18	17 06:46	17:19 18	17:24:18	17:30 18	17:30 48
Post	15 49 00	16 00 30	16 06 30	16:07 00	15 57 00	16 18 30	16 24 30	16 25 00	16 15 00	16 36 30	16 42 30	16 43 00	16 33 00	16 54 30	17:00:30	19:57 00	17 06.30	17 07:00	17:18:30	17:24:30	17:30 30	17 31 00
Track																						
Train	49	51	53	55	P1-DH-56	57	59	61	P2-DH-64	63	65	67	P3-DH-68	69	71	P4-DH-79	73	75	77	79	81	83
Station Dwell	00 11	00 05	00 05	00 11		00 05	00 05	00 11		00 05	00 05	00 11		00 05	00 05		00 05	00 11	00 05	00 05	00 05	00 11
Begin Track Use	15 45	15 58	19 02	16 03	15 53	16 14	16 20	16 21	16 11	16 32	16 38	16 39	16 29	16 50	16 58	16 53	17 02	17 03	17:14	17:20	17:26	17 27
End Track Use	16 00	16 06	16 12	16 16	16 02	16 24	16 30	16 36	16 20	16 42	16 48	16 54	16 38	17 00	17 06	17 02	17:12	17:16	17 24	17:30	17:38	17 42
Total Use	00 15	00 10	00 10	00 15	00 09	00 10	00 10	00 15	00 09	00 10	00 10	00 15	00 09	00 10	00 10	00 08	00.10	00:15	00 10	00 10	00 10	00 15

Outbound

Train	50	52	54	56	P1	58	60	62	P2	64	66	68	P3	70	72	P4	74	76	78	80	82	84
Equipment	REV	REV	REV	REV		REV	REV	REV		REV	REV	REV		REV	REV		REV	REV	REV	REV	REV	REV
Approach	18 05 11	18 11 11	18 17 11	18 23 11	18 07 11	18 29 11	18 35 11	19 41 11	18 25 11	19 47 11	18 53 11	18 59 11	18 43 11	17 05 11	17 11:11	17 07:11	17 17:11	17 23.11	17:29 11	17 35:11	17:41.11	17 47:11
Universal	18 04 20	18 10:20	18 19 20	18 22 20	18 06 20	18 28 20	18 34 20	18 40 20	18 24 20	18 46:20	18 52 20	18 58 20	18 42 20	17 04 20	17 10:20	17 08:20	17 19:20	17 22:20	17 28 20	17 34 20	17 40 20	17 46 20
Intermediate	18 03 11	18 09 11	18 15 11	18 21 11	18 05 11	18 27 11	18 33 11	18 39 11	18 23 11	19 45 11	18 51 11	18 57 11	18 41 11	17 03 11	17 08 11	17 05:11	17 15:11	17 21:11	17 27.11	17 33:11	17 39.11	17 45:11
Split	18 01 48	18 07 48	18 13 49	18 19 48	18 03 49	18 25 48	18 31 49	18 37 48	18 21 49	18 43 49	18 49 48	18 55 48	18 38 49	17 01 49	17 07.49	17 03 49	17:13.49	17 19:48	17:25 49	17 31.48	17 37.49	17 43 48
Station	18 00 45	18 06 45	18 12 45	18 18 45	18 02 45	18 24 45	18 30 45	18 36 45	18 20 45	18 42 45	18 48 45	19 54 45	18 36 45	17 00 45	17:06:45	17:02 45	17:12:45	17 18 45	17:24 45	17 30:45	17 36 45	17 42:45
Post	18 00:00	18:06:00	18:12:00	18:18:00	18:02:00	18 24.00	19:30 00	18:36:00	18:20:00	18:42:00	18:48:00	18:54:00	18 38 00	17:00:00	17:06:00	17:02:00	17:12:00	17:18:00	17:24:00	17:30:00	17:36:00	17:42:00
Track																						
Train	50	52	54	56	P1	58	60	62	P2	64	66	68	P3	70	72	P4	74	76	78	80	82	84

Use
3 Maximum

122 Total Minutes Used 7-8AM
67.8% Percent Utilization



Use
3 Maximum

122 Total Minutes Used 7-8AM
67 8% Percent Utilization

	Inbound Train	1 REV-DH		3 REV-DH		5 REV-REV		7 P1		9 REV-DH		11 REV-REV		13 P2		15 REV-DH		17 REV-REV		19 P3		21 REV-DH		23 REV-REV		25 P4		27 REV-DH		29 REV-DH		31 REV-DH		33 REV-DH		35
	Outbound Train	DH	2 DH	DH	4 DH	REV	6	8 P1-DH7		DH	10 DH	REV	12	14 P2-DH13		DH	16 DH	REV	18	20 P3-DH19		DH	22 DH	REV	24	26 P4-DH25		DH	28 DH	DH	30	DH	32	DH	34	DH	36
07 00	1	1	1																																	
07 01	1	1	1																																	
07 02	1	1	1																																	
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07 58	2																			1			1													
07 59	2																			1			1													

3 Maximum

137 Total Minutes Used 16.30-17.30
78.1% Percent Utilization

	Inbound Train		49	51		53		55 P1-DH-56		57		59		61 P2-DH-64		63		65		67 P3-DH-68		69		71 P4-DH-70		73		75		77		79		81		83
	Outbound Train		REV-REV	DH-REV		DH-REV		REV-REV		DH-REV		DH-REV		REV-REV		DH-REV		DH-REV		REV-REV		DH-REV		DH-REV		DH-REV		REV-REV		DH-REV		DH-REV		REV-REV	
				50		52		54		56 P1		58		60		62 P2		64		66		68 P3		70		72 P4		74		76		78		80		82	
			REV		REV		REV		REV		REV		REV		REV		REV		REV		REV		REV		REV		REV		REV		REV		REV		REV	
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Tracks In Use
3 Maximum

137 Total Minutes Used 16:30-17:30
78.1% Percent Utilization

	Inbound Train		49		51		53		55 P1-DH-56		57		59		61 P2-DH-64		63		65		67 P3-DH-68		69		71 P4-DH-76		73		75		77		79		81		83
	Outbound Train	REV-REV		DH-REV		DH-REV		REV-REV			DH-REV		DH-REV		REV-REV		DH-REV		DH-REV		REV-REV		DH-REV			DH-REV		REV-REV		DH-REV		DH-REV		DH-REV		REV-REV	
		REV	50	REV	52	REV	54	REV	56 P1		REV	58	REV	60	REV	62 P2	REV	64	REV	66	REV	68 P3	REV	70	REV	72 P4	REV	74	REV	76	REV	78	REV	80	REV	82	REV	84
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